State variations in physician capacity to treat opioid dependencies with medication-assisted treatment

Ryan Yoder

The Ohio State University, College of Public Health

Abstract

Background: The opioid epidemic is a current public health crisis that affects millions of Americans. According to the Centers for Disease Control and Prevention (CDC), deaths due to opioid overdoses have increased at a rate that has lowered the national life expectancy for the first time in decades. Access to opioid treatment for people with opioid dependencies allows people an opportunity to seek recovery for their addiction. Medication-assisted treatment (MAT) is becoming an effective method of care; combining behavioral therapy and medication. The federal government permits clinicians that are not apart of opioid treatment programs to apply for waivers that allow them to individually prescribe MAT drugs. Thus, physician capacity—the proportion of physicians available to prescribe MATs—affects access to this type of care. However, physician capacity to prescribe MATs are rarely touched upon in the literature, even though it is a large factor in increasing access to care.

Method: The purpose of this study is to examine the association between physician capacity to prescribe MATs and related policy and public programs. This is a retrospective observational study that examines physician capacity trends from 2007 to 2016. Using data from the Substance Abuse and Mental Health Services, the number of opioid treatment programs and physicians with specific waivers to prescribe MATs were counted and standardized by population. The State Drug Utilization data from the Centers for Medicare & Medicaid Services, age-adjusted opioid overdose death rates from the Centers for Disease Control and Prevention, and other variables studied were also examined by state and by year. Treatment capacity and mortality variables were divided into quartiles by year.

Results: High capacity states had more growth in buprenorphine waivers between 2007 and 2016. High capacity states were also more likely to have expanded their Medicaid programs. States with low physician capacity to treat with MAT were less likely to have expanded their Medicaid programs and had the lowest proportion of state level substance use risk assessments policies as a requirement or recommendation to physicians before prescribing pain medication.

Conclusion: Understanding the commonalities of high capacity states may offer an insight to possible policy interventions to confront the opioid epidemic. Furthermore, research that blends the worlds of public policy and public health are important for combatting this multifaceted problem.

Introduction

Deaths attributed to accidental opioid overdose have significantly increased in America over the past two decades. According to the Centers for Disease Control and Prevention (CDC), overdose deaths from prescription opioid drugs and illicit opioid drugs like heroin are five times the rate in 2016 that they were in 1999 (Hedegaard, Warner, & Miniño, 2017). This trend of increased mortality is referred to as the opioid epidemic. The opioid epidemic has surged as each year more Americans die from unintentional overdoses and the epidemic has been declared a public health emergency.

It is crucial that there are more effective prevention efforts to reduce the health impacts of the opioid epidemic as well as access to treatment and recovery programs for those who experience opioid dependencies. There are many discrepancies in the current drug treatment landscape. With geographical and organizational barriers, it is necessary to ensure those entering drug treatment for opioids are experiencing comprehensive forms of care. Medication-assisted treatment (MAT) is considered best-practice for opioid dependencies. MAT is seen as more inclusive than traditional forms of detoxification and treatment.

Background

Medication-assisted treatment (MAT) utilizes both behavioral therapy and medication that affects opioid receptors. This form of treatment has shown to be effective for treating opioid dependencies. This type of treatment has also been shown to improve overall quality of life, including lowering risks of infectious diseases,

decreases the risk for relapse, increases in employment, and overall patient experience (SAMHSA, 2018). MAT typically uses one of three drugs—methadone, buprenorphine, and naltrexone—to correct chemical balances in in the brain. Methadone is an opioid agonist, which binds to opioid receptors like other prescription opioids and heroin but releases chemicals at a steadier, more controlled rate. Buprenorphine is similar to methadone; the medication relieves cravings and withdraw symptoms. However, buprenorphine is a partial-opioid agonist and will only produce moderate chemical responses. Buprenorphine also lowers the risk of misuse and overdose compared to methadone due to the chemical composition. Naltrexone is used in MAT as an injectable drug that is administered once a month. As an opioid antagonist, naltrexone blocks opioids from attaching onto receptors and reduces cravings. The Substance Abuse and Mental Health Services Administration states that when these medications are combined with counseling, this approach can effectively treat addiction (SAMHSA, 2018).

These medications are highly regulated; both methadone and the injectable form of naltrexone must be administered at accredited opioid treatment programs (OTP). Buprenorphine may also be prescribed at an OTP, but can also be part of an outpatient treatment plan. Due to the Drug Addiction Treatment Act of 2000, clinicians are able to prescribe buprenorphine in outpatient settings by obtaining federal waivers (Drug Addiction Treatment Act of 2000). Physicians who obtained these waivers were able to initially treat up to 30 patients at a time, starting in 2002. Amendments in 2007 and 2017 allowed physicians to raise the patient limit to 100 and 275 at a time, respectively.

These increases can be granted after the physician has seen the previous limit for at least one year.

This has dramatically improved the access to MAT. Adoptions of these waivers and increases in OTPs have allowed more individuals to seek treatment for opioid addiction. However, the growth of treatment has not been evenhanded and due to unequal policies, health insurance programs, and other structural factors, many individuals are not able to receive medication-assisted treatment. The purpose of this study is to analyze the variations of MAT access by focusing on physician capacity across the states and the District of Columbia. Physician capacity is described as the proportion of physicians available to prescribe MATs—through OTPs or federal waivers. Specifically, Medicaid program expansion, Medicaid drug utilization and reimbursement, specific opioid prescribing polices, and overdose death rates were studied. Examining how state-level factors correlate to relatively higher or lower capacities can provide guidance for future policy solutions.

Literature Review

Underutilization of medication-assisted treatment

As the opioid epidemic has become more salient, researchers are producing work to reflect current practices, difficulties, and advancements in medication-assisted treatment and its utilization. One major issue is that MAT is underused. This is partly related to limited access of opioid treatment programs and physician offices. A national-level review published in the American Journal of Addictions found that potential patients have difficulties accessing substance abuse treatment in 85% of counties

(Levin et al, 2016). That result was referring to any kind of substance abuse treatment, not specifically MAT, which is even scarcer. Another study calculated that less than half of counties have a waivered physician that is able to prescribe buprenorphine, and these counties contain over 90% of all citizens (Rosenblatt et al, 2015). This leaves thirty million people in counties without a waivered physician—most of them resided in rural counties.

The Food and Drug Administration (FDA) has approved the current MAT drugs to be effective with opioid dependency treatment; however they remain not fully utilized. Among clinicians with buprenorphine waivers, about half (44%-66%) are actively writing prescriptions for the drug, and only a small percentage of clinicians are reaching their maximum limit of 30 or 100 patients at a time (Jones et al, 2015).

Enhancing physician capacity may address the issue of MAT underutilization. As the number of potential providers increase, individuals seeking treatment may be able to gain access through their insurance network. Creating closer proximity to MAT treatment sites may also allow for greater utilization as millions of Americans live in areas without these services currently. There is also the issue that there are current office-based physicians that are not reaching their prescribing limits. These may be due to the physician being outside of individual's provider networks or be a burden for patients to access. For example, a psychiatrist that can prescribe buprenorphine may have high copays or not be included in insurance plans. That is why increasing the pool of providers may increase utilization of medication-assisted treatment. However, the

current literature has not suggested an optimal threshold for the number of MAT providers.

Relevant policies and programs

The application of medication-assisted treatment has overwhelming documentation to be underutilized, and recent policies have been executed to combat that. The Drug Addiction Treatment Act (DATA 2000) mentioned previously has been a major policy targeting treatment expansion and access to buprenorphine-assisted treatment. Information from the Drug Enforcement Agency states that in 2002—the first year of the DATA 2000 implementation—around 2,000 physicians applied for waivers, and by 2011 over 20,000 physicians had applied (Knudsen, 2015). One rationale of DATA 2000 is to decrease geographical barriers to treatment and create more integration of addiction treatment with other forms of chronic disease care (Jones et al, 2015). In theory, a physician in a primary care setting who notices a lack of local opioid treatment facilities can apply for a buprenorphine waiver to provide more access to care.

A limit to this rationale is the reality of medically underserved areas in the United States. This policy was partly designed to increase treatment access in areas without opioid treatment facilities or other existing forms of treatment. However, these typically include areas that have shortages of medical providers. Without available physicians, areas will remain to lack access to medication-assisted treatment.

Adoption of waivers by physicians may be contingent on other political and structural factors. Medicaid programs have been cited to correlate with access to opioid dependency treatment. In addition, studies have linked differences in Medicaid

coverage as a factor in MAT availability (Jones et al, 2015). Under the Patient Protection and Affordable Care Act of 2010, states had the option to expand their Medicaid programs. These expansions would raise health insurance eligibility to households with income at or below 138% of the federal poverty level, which would provide coverage to a population with statistically high opioid addiction (Wen et al, 2017). As of 2016, 31 states and the District of Columbia opted to expand their programs. A quasi-experimental study on the effects of Medicaid expansion in 2014 found that expansion states increased buprenorphine spending through Medicaid by 49.9% (Wen et al, 2014). The same study concluded that expansion attributed to 70% more buprenorphine prescriptions.

Disparities in access and utilization

There are parts of the country with shortages in healthcare professionals and states that have not expanded their Medicaid programs; state level factors like these create inequalities in access to medication-assisted treatment. The lack of integration of mental health and other forms of medicine has also created barriers and substandard health outcomes (Levin et al, 2016). Regional differences have shaped many of the present issues in access to opioid use treatment. Opioid treatment programs are clustered/concentrated in urban areas (Stein et al, 2015), As opioid treatment programs have increased in metropolitan areas, rural areas have experienced large increases in physicians obtaining waivers (Knudsen, 2015). However, there is still a disparity between urban and rural access to addiction treatment.

In another context of geography, there are also regional differences to treatment potential. A state level analysis reported that states in the Northeast had statistically significantly more options for buprenorphine treatment than other regions, with the Midwest having the least (Knudsen, 2015). When examining federal buprenorphine waivers specifically, the irregularities between states and regions may suggest large differences in physician attitudes and behaviors. A paper produced by the Office of Public Health Strategy and Analysis of the FDA examined physician barriers in applications for federal waivers. The findings revealed "barriers include willingness to prescribe, low provider confidence in addressing addiction, limited access to addiction experts, lack of institutional or office support, lack of behavioral health services, and reimbursement concerns (Jones et al, 2015)." Both provider and patient difficulties are important to understand in order to address the under utilization of MAT during the opioid epidemic.

Possible solutions

The current literature poses some potential solutions. Expanding the pool of potential providers is a key suggestion. One way to increase the number of buprenorphine-waivered practitioners is to amend the law to include physicians assistants and nurse practitioners (Levin et al, 2016). Allowing physicians assistants and nurse practitioners to prescribe MAT would be a positive step towards integrating addiction treatment in medical settings and could benefit areas that are medically underserved. Currently, psychiatrists are the group of doctors with the highest rate of buprenorphine waiver attainment, followed by pain management, physical rehabilitation,

family medicine, and internal medicine (Rosenblatt et al, 2015). Physician specialty may be another source for strategies to expand MAT. Physician capacity to prescribe buprenorphine has been associated with economic improvements and the number of specialists in an area increases with income (Knudsen, 2015).

The climate surrounding medication-assisted treatment impacts policy solutions as well. Higher proportions of treatment facilities may be indicative of more supportive state and local governments, who in turn allocate more resources to opioid dependency treatment (Knudsen, 2015). Since behavioral health in general is legislated and regulated separately from other types of medical practices, understanding political feasibility and identifying stakeholders is key in advocating for MAT expansion. Government officials and clinicians may be unaware of the outcomes of MAT utilization. Targeting institutions and educating healthcare professionals about addiction treatment may increase support (Jones et al, 2015). Stigma is an ongoing hurdle in the realm of addiction treatment and educating both practitioners and administrators can efficacy in MAT.

Focusing on buprenorphine waivers is another strategy. Increasing the number of waivered physicians is the goal of many public health professionals. More physicians in rural areas have received waivers than physicians in urban counties (Stein et al, 2015). As more research is done on MAT, more providers may gain the confidence to apply for waivers. However, there may be outcome differences in 30-patient and 100-patient waivered physicians and their effect on improving access. Researchers from the RAND Corporation, a national policy think tank, studied the buprenorphine dispersion between

the two capacities and found that 100-patient waivered physicians had substantially more impact on growth than 30-patient waivered physicians (Stein et al, 2015). In the public health sphere with scarce resources, focusing specifically on increasing 100-patient waivered physicians—and not necessarily increasing the total number of waivered physicians—may be a more beneficial investment. Policies that give support to 30-pateint waivered physicians to increase their number of patients by apply to 100-patient waivers and retain providers in the market are viable options. The current maximum capacity for waivered physicians is 275 patients. Once research can measure the effects of this higher capacity it can be postulated if larger maximums are another strategy for treatment growth. This study aims to examine state variations in treatment capacity while taking into account the relevant policies, inequalities, and possible solutions.

Methods

Data

This is a retrospective observational analysis. This study examined data from 2007 to 2016 in order to assess long-term policy implications and their connections to physician capacity. The unit of analysis is state-year. The Substance Abuse and Mental Health Services Administration (SAMHSA) provided public information on the number of DATA-waivered physicians for 30 and 100 patients for each state. The National Survey of Substance Abuse Treatment Facilities (N-SSATS) from SAMHSA documented the number of opioid treatment programs that offered some form of medication-assisted treatment (buprenorphine, naltrexone, and/or methadone). N-SSATS data was taken

from 2013 to 2016 due to changes in reporting previous years of the survey that would have led to inconsistencies in the analysis. Numbers of patient waivered physicians and opioid treatment programs account for physician capacity variables.

A major dataset that was used was the Centers for Medicare & Medicaid (CMS) State Drug Utilization Dataset that had record of the number of prescriptions made per year for each state and the District of Columbia. The State Drug Utilization Datasets also included reimbursement information that this study analyzes. Data from 2007 to 2016 created variables for utilization and reimbursement with the total Medicaid and non-Medicaid number of prescriptions made and the total Medicaid and non-Medicaid amount reimbursed to pharmacies in the state that, respectively.

This study was interested in quantifying a state's burden related to the opioid epidemic. Burden was extrapolated from opioid-related overdose mortality that would capture overdoses from prescription drugs and illicit drugs like heroin and illicit fentanyl. Opioid overdose mortality data was gathered from the Centers for Disease Control and Prevention (CDC) National Center of Injury Prevention and Control and were age-adjusted and were standardized per 100,000 people. Overdose mortality was collected for each state and the District of Columbia from 2013 to 2016.

Analytic Strategy

To gain a better understanding of the factors that impact physician capacity, multiple variables were used in this study. The variables created to measure physician capacity were transformed into rates of physicians with 30-patient waivers, the rate of physicians with 100-patient waivers, and rate of opioid treatment programs, all

population-adjusted per 1 million residents. Total number of buprenorphine, naltrexone, and methadone prescriptions and amount reimbursed were sorted from the CMS State Drug Utilization datasets and then population adjusted per 1 million residents. Yearly state populations were documented from the United States Census Bureau annual estimates and were used for all population-adjusted calculations.

This study in interested in other possible policy influences. State Medicaid program expansion was recorded for the states that choose to expand programs with 1115 waivers during the study period. Prescription drug monitoring programs are another topic focused on in the literature that is seen as a factor when prescribing MATs. Using data from the National Alliance For Model State Drug Laws (NAMSDL), it was noted if a state had a requirement/recommendation that physicians assess patients for substance use disorders (SUD) before prescribing pain medications. It was logged if states and the District of Columbia did or did not have these requirements/recommendations in 2016. Both expansion and prescribing variables were coded as binary.

Analysis

Graphs were created to illustrate longitudinal trends of MAT treatments by state and by physician capacity. To accomplish this, 30-patient waiver, 100-patient waiver, opioid treatment program, and mortality data from each state and D.C. were organized into quartiles by year. Quartile 1 would represent states with the lowest averages and Quartile 4 representing states with the highest averages. For example, a state with a relatively high rate of overdose deaths would be in Quartile 4 that year.

The statistical software Stata was used to perform hypothesis testing. Two sample t-tests were performed to examine differences in capacity means with reference to Medicaid expansion and SUD risk assessment policies. For hypothesis testing, 95% confidence intervals were used.

Results

The main outcome investigated was the variability of waivered physicians and opioid treatment programs in states. Longitudinal trends in waivered physician capacity were graphed. Among 30-patient waivered physicians, there was a steady increase in Quartile 1, 2, and 3 groups (Figure 1). The trends seem to follow almost uniformly. However, the Quartile 4—highest waivered—group appears to have a distinct pattern of growth that the lower three groups do not share. Between 2007 and 2016, the mean 30-patient waiver capacity grew from 17.3 waivered physicians per 1 million residents to 42.3; a 144% increase. In the same time period, the mean 30-patient waiver rate for Quartile 3 increased from 9.9 to 16.9 (70% increase). Quartile 1 and 2 also increased from 7.0 to 11.3 (61% increase) and 3.6 to 6.2 (72% increase), respectively.

Rates of physicians waivered per 1 million residents for up to 100 patients also fluctuated during the study period (Figure 2). 2007 was the first year physicians had the ability to increase their patient prescribing limit form 30 to 100. Overall, after 2007 there was an immediate drop in the number of 100-patiet waivered physicians followed by a general increase. There is no apparent policy reason for the attrition. Between 2008 and 2016 the quartiles experienced shifts in 100-patient waivered physician rates from 0.65 to 1.6, 1.4 to 4.1, 2.2 to 6.2, and 4.2 to 13.1, respective to Quartile 1, 2, 3, and 4.

Additionally, the last few years of the study observed smaller gains in 100-patient waivers.

Mirroring the Quartile 4 trends of 30-patient waivers, 100-pateint waivered physician rates in Quartile 4 are dramatically larger in comparison to other quartiles. It appears that high capacity states are more effective at increasing the number of total waivered clinicians. In 2015 and 2016, eight of the thirteen states in Quartile 4 for 30-patient waivered physicians were also considered high capacity states (Quartile 4) for 100-patient waivers. These states are Connecticut, Massachusetts, Maine, New Hampshire, New Mexico, Rhode Island, Vermont, and West Virginia.

Also notable, of those eight states all but Connecticut are in the Quartile 4 for rates per 1 million residents of OTPs that utilize MAT. This correlation is important in understanding the nuances of high capacity states. The rationale of the federal waivers was to increase access to MAT in areas where inpatient and intensive outpatient programs were not as accessible. However, the states with the most treatment facilities per residents have surpassed others in office-based physicians obtaining these federal waivers. The existence of opioid treatment programs may have underlying factors that influence the attainment of waivers. State run programs and policies like Medicaid programs, funding and reimbursement, and general attitudes towards mental health and substance use disorders may be root causes as to why these two separate delivery systems surge simultaneously. Regional variations in physician capacity also persist, as New England is overrepresented among these seven states.

An element of these trends that is significant when discussing the impacts of policy on medication-assisted treatment access is the Medicaid expansion implementation under the Affordable Care Act. At the beginning of 2014, 26 states and the District of Columbia had opted to expand their states' Medicaid coverage to include individuals below 138% of the poverty line. Of these states, California, Minnesota, and New Jersey had expanded programs since 2011. The growth of Medicaid programs may attribute to the sharp increase of newly waivered physicians, specifically in high access states. As this new cohort became able to gain health insurance, they would have finally been able to afford addiction treatment and the medication prescriptions for MAT. In 2014 and 2015, all states in Quartile 4 for 30-patient waivered physicians but Arkansas, Maine, and Tennessee had expanded Medicaid programs. In 2016, only Arkansas and Maine were non-expansion states in Quartile 4; Tennessee was no longer in Quartile 4. Using a two-sample comparison of means between expansion and non-expansion states in Quartile 4 did not yield statistically significant results, because on the small sample size of non-expansion states.

Differences in average physician capacity for expansion and non-expansion states were explored. In 2014, the mean rate of 30-patient waivered physicians per 1 million residents for expansion states—regardless of quartiles—was statistically significantly larger than the mean number of 30-patient waivered physicians for non-expansion states (12.01 vs. 7.60, p=0.0097). There was not a statistically significant difference between 100-patient waivers between groups that year (Table 1). In 2015, the mean number of 30-patient waivered physicians for expansion states was

statistically significantly larger than the mean rate of 30-patient waivered physicians for non-expansion states (14.92 vs. 9.36, p=0.0264). The average number of 100-patient waivers was also statistically significantly more for expansion states (6.39 vs. 3.92, p=0.0180) (Table 2). In 2016, the mean number of 100-patient waivered physicians for expansion states was statistically significantly larger than the mean rate of 100-patient waivered physicians for non-expansion states (7.22 vs. 4.73, p=0.0333). There was not a statistically significant difference between 30-patient waivers between groups that year (Table 3). Lastly, the average rate for opioid treatment programs with access to MAT was not found to be statistically different among Medicaid expansions group.

The proportion of states that chose to expand Medicaid eligibility by quartile for 2014, 2015, and 2016 were also examined. A presumption was that states that increased their Medicaid programs would be more represented in high capacity states since millions of new patients would have gained access to medication-assisted treatment. Using two sample proportion tests, expansion and non-expansion groups were compared by quartile-year for 30-patient waivers (Table 4) and 100-patient waivers (Table 5). For both 2016 and 2014, there were statistically significantly more Medicaid expansion states than there were non-expansion states in Quartile 4 for 30-patient waiver rates. Also for 30-patient waiver rates, there were statistically significantly more non-expansion states than there were expansion states in Quartile 1 in 2015. For 2014, there were statistically significantly more non-expansion states than there were expansion states in Quartile 2 for 30-patient waiver rates. For 100-patient waiver quartiles, there were statistically significantly more Medicaid expansion states than there

were non-expansion states for Quartile 4 in 2016. These tests indicate that 2016 had significantly more Medicaid expansion states high capacity quartiles for both patient prescribing limits. The role of Medicaid expansion on access to medication-assisted treatment may be starting to produce noticeable beneficial effects.

When examining physician capacity rates and a state's requirement or recommendation that physicians screen for substance abuse risk before prescribing pain medication, patterns emerged. In 2016, only four of the thirteen states (30.8%) in Quartile 1 for total waivered physician rate (both 30-patient and 100-patient combined) had the requirement/recommendation. In Quartile 2, the proportion increases to ten states (76.9%). Quartile 3 has nine states (69.2%) and Quartile 4 has ten states (76.9%). An almost equal number of states in the top three quartiles have introduced this policy into their prescription drug monitoring programs, however the majority lowest capacity states in 2016 have yet to. Perhaps lawmakers in these low capacity states do not see these screening as necessary, and the lack of priority put on substance use disorder prevention and intervention feeds into the relatively low numbers of federally waivered physicians that can supply MAT.

There was no statistically significantly difference in rates of 30-patient waivers between states that have the assessment policy and states that do not. However, the average number of 100-patient waivers was statistically significantly more for states that had the prescribing procedure as a requirement or recommendation. (7.24 vs. 4.56, p=0.0249). Any correlation between the two groups and rates of opioid treat programs were not explored as this policy was not relevant for clinicians in that setting (Table 6).

This policy may be seen as helpful in increasing medication-assisted treatment utilization. A possible rationale could be that with the increased screening for substance use disorder, there will most likely be more diagnoses for opioid dependency. More SUD diagnoses would lead to more people seeking treatment and a greater increase in physician capacity for treatment. Another explanation may be that state policymakers feel more comfortable enacting the policy if there is a sufficient pool of MAT providers in that state. That way, providers can link individuals with opioid dependency risk to care.

Opioid-related overdose mortality had the tendency to increase with the rate of federal waivers in a state. For states with the highest 30-patient waiver rates in 2016, the mean age-adjusted opioid overdose mortality (per 100,000) was statistically significantly higher than average mortality of the lowest two quartiles (Table 7). As mentioned previously, opioid overdose mortality is being used as a measure for the opioid burden afflicted on each state and D.C. It could be that as the opioid epidemic becomes more salient in a state, a clinician is seeks out these federal waivers as an opportunity to mitigate some of the disease burden.

Age-adjusted overdose mortality averages by quartile look similar for 100-patient waiver data for 2016 (Table 8). The mean overdose death rate for Quartile 4 was 31 deaths per 100,000 people. This is statistically significantly different than the means of Quartile 1 (13.3) and Quartile 2 (18). The average mortality rate for Quartile 3 (23.1) was also statistically significantly higher than the mean for Quartile 1.

These results demonstrate a positive correlation between opioid overdose mortality and physician capacity to treat opioid dependency with MAT. States with

higher opioid-related overdoses tend to have higher physician capacities of both patient-prescribing limits. In future modeling of what drives buprenorphine waiver adoption, opioid disease burden should be acknowledged. Perhaps, another added social benefit to buprenorphine waivers are that it gives physicians an opportunity to feel efficacious about an issue surrounds them. Clinicians in higher mortality states may feel more impacted by the opioid epidemic and utilize these federal waivers more often.

An attempt was made to explore the phenomenon of reverse causality, where it could be argued that states that are more affected by the opioid epidemic are utilizing buprenorphine, naltrexone, and methadone more. Taking states in the highest quartile for overdose morality in 2016, the rates of MAT utilization and pharmacy reimbursement were compared (Figure 3). Both reimbursement and utilization were population-adjusted per 1 million people. There is obvious variability between high mortality states. Though these states and D.C. have similar rates of age-adjusted overdose deaths, the frequency of MAT prescriptions ranged from 14,800 per 1 million residents in D.C. to 84,300 in West Virginia. Reimbursement—and primarily reimbursement rates—of these medications also fluctuate between high mortality states. The amount of money pharmacies were reimbursed for MAT drugs in each state were also adjusted by population. In D.C., the population-adjusted rate for drug reimbursement was $484,779.77, but was $13,243,211.20 for West Virginia. Of these states, all but one—Delaware—were above the 50th percentile for both 30-patient and 100-patient waiver rates.

The same variability was seen among utilization and reimbursement rates of low mortality states, but on a smaller scale (Figure 4). Frequency of MAT prescriptions ranged from 574 per 1 million residents in South Dakota to 6,100 in Minnesota. When looking at population-adjusted drug reimbursement, South Dakota paid back $90475.16 per 1 million residents to pharmacies while Minnesota paid back $1,356,773.78 per million residents. Of the thirteen low mortality states, ten of them were under the 50th percentile for both 30-patient and 100-patient waiver rates. This illustrates than although utilization and reimbursement rates were diverse across states with similar opioid burden, general trends of physician capacity and utilization/reimbursement were linear.

Discussion

This study aimed to analyze access to medication-assisted treatment and how various federal and state policies have fueled current access inequalities at the state level. States with the highest rates of buprenorphine waivers and opioid treatment programs appear to habitually improve while lower capacity states remain rather stagnant in access outcomes. As shown, high capacity states had more growth in both 30-patient and 100-patient buprenorphine waivers between 2007 and 2016. High capacity states were also more likely to have expanded their Medicaid programs. Additionally, states with low physician capacity to treat using MAT were less likely to have expanded their Medicaid programs and had the lowest proportion of state level SUD assessment policies as a requirement or recommendation to physicians before prescribing pain medication.

These observations reinforce findings of past research. Medicaid program expansion appears to play a role in treatment access and utilization. Also, efforts made in prioritizing substance use treatment in legislatures are impactful and may be indicators of attitudes about addiction and treatment. Like past studies have implied, access to MAT varies by region. Most of the high capacity states were represented in the Northeast region of the country, but the span and recency of this study has added more depth to that claim. Not all Northeast states have the same physician capacity rate and as Midwest states have experienced increases in mortality from the opioid crisis, states like Ohio and West Virginia have moved into high-capacity groups.

It is important to understand that the purpose of this research—and all research in the field of addiction treatment—is to better assess both the personal barriers and larger structures that impact patient outcomes. Access is a key factor in this discussion, but increasing access is not the panacea to the opioid crisis. The physical, mental, and social consequences of addiction are interlocked and although an improvement to one area may relieve issues in another, there are other elements that should be examined.

It is imperative to evaluate health outcomes through a policy lens. Evidence-based policy implementations are going to define how the United States combats the current opioid epidemic. Through this research, it is shown that there are current policies and programs that are beneficial to increasing medication-assisted treatment access. Policies may lag in initial outcome observations, but there are some impacts being made already in opioid dependency treatment and the health care market in general. It would be advantageous for future research to create predictive models that

can be tested to gauge what policies and programs have stronger causal relationships with MAT access. Understanding the commonalities of high capacity states may offer an insight to possible policy interventions to confront the opioid epidemic. Furthermore, research that blends the worlds of public policy and public health are important for combatting this multifaceted problem.

References

Drug Addiction Treatment Act of 2000. H.R. 2634 — 106th Congress.

Hedegaard H, Warner M, & Miniño AM. (2017). Drug overdose deaths in the United States, 1999–2016. *National Center for Health Statistics.*

Jones, C. M., Campopiano, M., Baldwin, G., & McCance-Katz, E. (January 01, 2015). National and State Treatment Need and Capacity for Opioid Agonist Medication-Assisted Treatment. *American Journal of Public Health, 105,* 8, 55-63.

Knudsen, H. K. (January 01, 2015). The Supply of Physicians Waivered to Prescribe Buprenorphine for Opioid Use Disorders in the United States: A State-Level Analysis. *Journal of Studies on Alcohol and Drugs, 76,* 4, 644-54.

Levin, F. R., Bisaga, A., Sullivan, M. A., Williams, A. R., & Cates-Wessel, K. (December 01, 2016). A review of a national training initiative to increase provider use of MAT to address the opioid epidemic. *The American Journal on Addictions, 25,* 8, 603-609

Rosenblatt, R. A., Andrilla, C. H. A., Catlin, M., & Larson, E. H. (January 01, 2015). Geographic and Specialty Distribution of US Physicians Trained to Treat Opioid Use Disorder. *Annals of Family Medicine, 13,* 1, 23-26.

Stein, B. D., Pacula, R. L., Gordon A. J., Burns R. M., Leslie, D. L., Sorbero, M. J., Bauhoff, S., Mandell, T. W., & Dick, A. W. (September 01, 2015). Where Is Buprenorphine Dispensed to Treat Opioid Use Disorders? The Role of Private Offices, Opioid Treatment Programs, and Substance Abuse Treatment Facilities in Urban and Rural Counties. *Milbank Quarterly, 93,* 3, 561-583.

Substance Abuse and Mental Health Services Administration. (2018) Medication-assisted treatment.

Wen, H., Hockenberry, J. M., Borders, T. F., & Druss, B. G. (April 01, 2017). Impact of Medicaid Expansion on Medicaid-covered Utilization of Buprenorphine for Opioid Use Disorder Treatment. *Medical Care, 55,* 4, 336-341.

Appendix

Figures

Figure 1. 30-Patient Waiver Capacity Trends by Quartile (2007-2016).

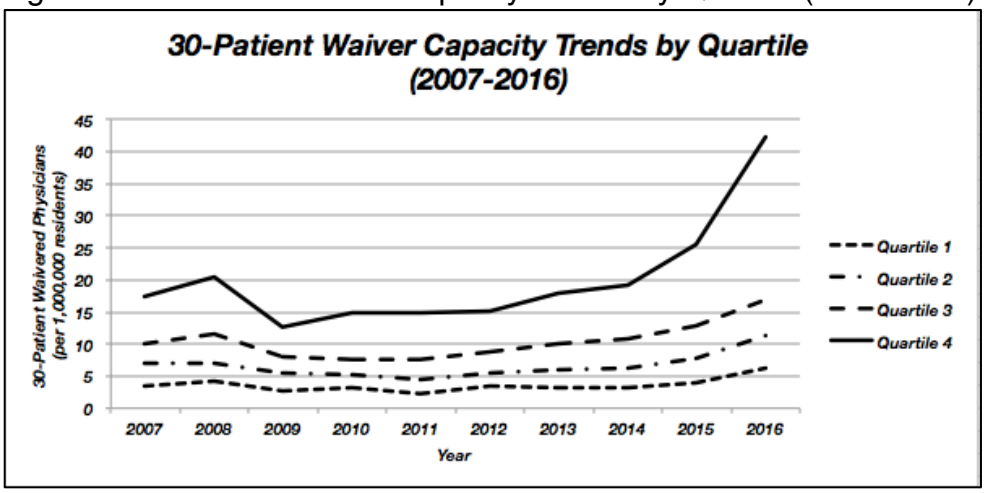


Figure 2. 100-Patient Waiver Capacity Trends by Quartile (2007-2016).

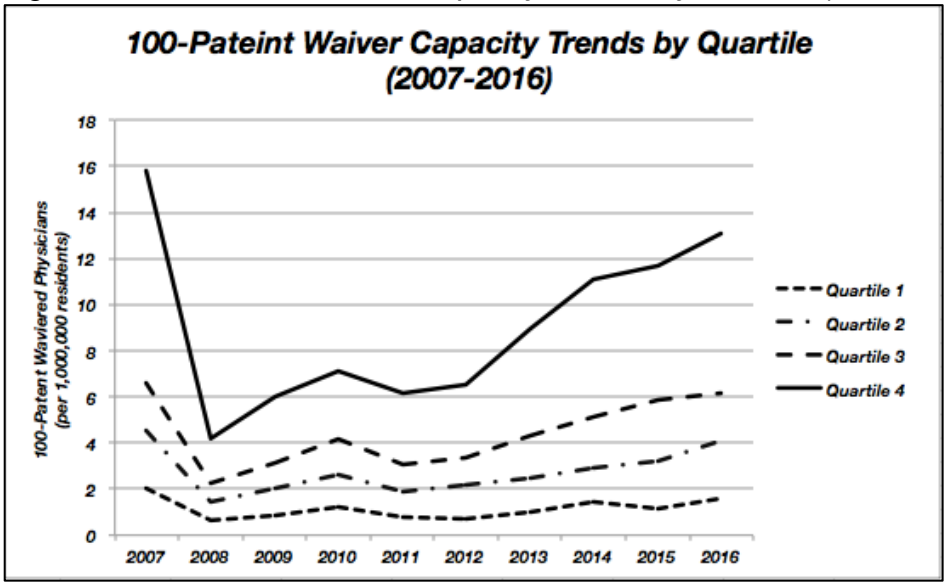


Figure 3. MAT Utilization and Reimbursement Among High Mortality States (2016).

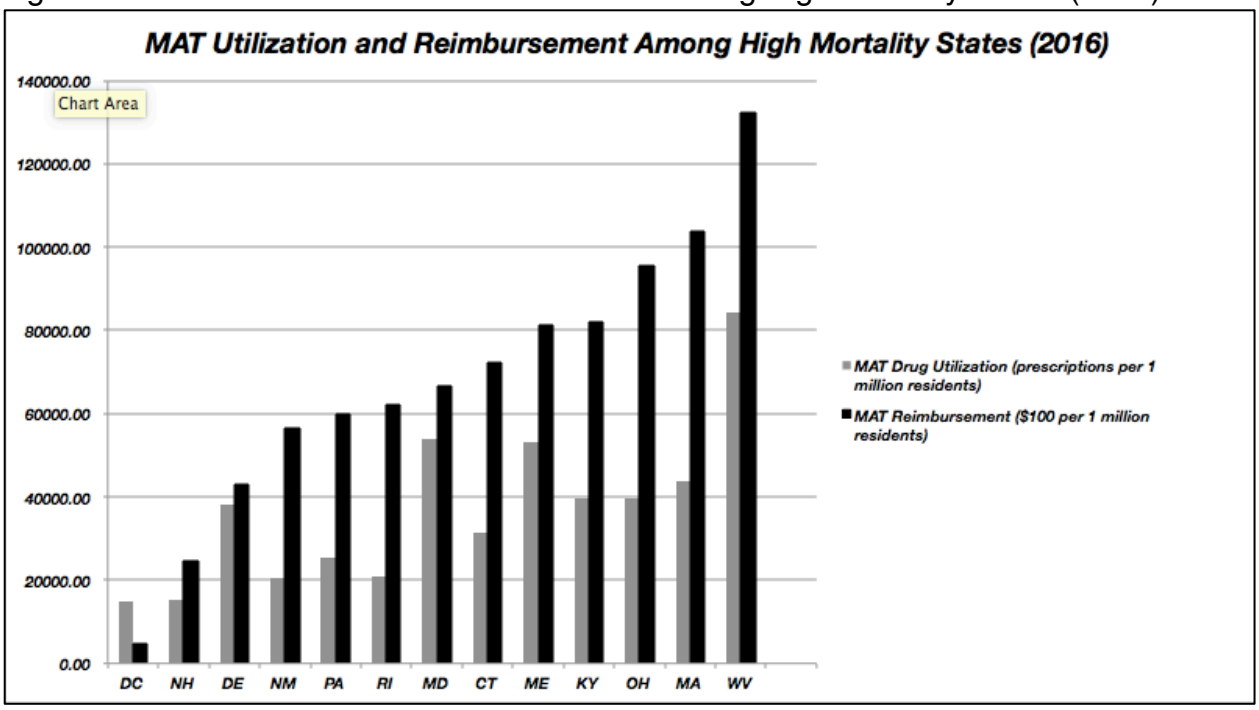
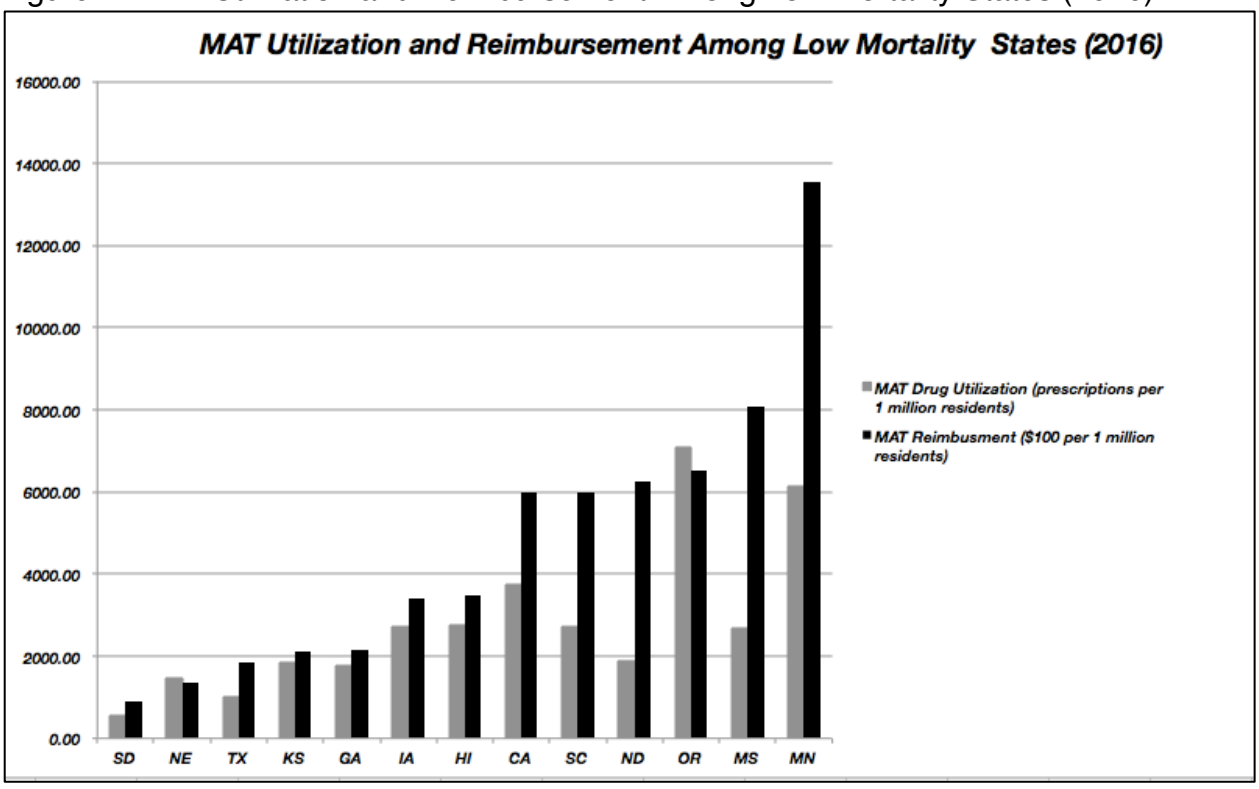


Figure 4. MAT Utilization and Reimbursement Among Low Mortality States (2016).



Tables

Table 1. Mean Differences in Physician Capacity by Medicaid Expansion group (2016).

	Mean of 30-Patient Waiver rate	Mean of 100-Patient Waiver rate	Mean of Opioid Treatment Program rate
Medicaid Expansion States (n=32)	21.74± 6.93	7.22± 1.73	369.63± 364.4
Non-Medicaid Expansion States (n=19)	15.05± 7.38	4.73± 1.99	234.36± 222.14
P(T<t)	p=0.1013	p=0.0333	p=0.2928

Table 2. Mean Differences in Physician Capacity by Medicaid Expansion group (2015)

	Mean of 30-Patient Waiver rate	Mean of 100-Patient Waiver rate	Mean of Opioid Treatment Program rate
Medicaid Expansion States (n=30)	14.92± 4.04	6.58± 1.88	847.81± 756.36
Non-Medicaid Expansion States (n=21)	9.36± 3.73	3.92± 1.37	388.60± 300.87
P(T<t)	p=0.0264	p=0.0180	p=0.8388

Table 3. Mean Differences in Physician Capacity by Medicaid Expansion group (2014)

	Mean of 30-Patient Waiver rate	Mean of 100-Patient Waiver rate	Mean of Opioid Treatment Program rate
Medicaid Expansion States (n=27)	12.01± 2.98	5.84± 1.80	801.79± 756.41
Non-Medicaid Expansion States (n=24)	7.60± 2.17	4.05± 1.66	395.06± 273.69
P(T<t)	p=0.0097	p=0.1154	p=0.1631

Table 4. Proportion of Medicaid Expansion States by 30-Patient Waiver Rate. (2014-2016)

Year	2016				2015				2014			
Quartile (% Medicaid Expansion States)	Q1 (53.8)	Q2 (53.8)	Q3 (58.3)	Q4 (84.6)	Q1 (30.8)	Q2 (53.8)	Q3 (75)	Q4 (76.9)	Q1 (53.8)	Q2 (15.4)	Q3 (66.7)	Q4 (76.9)
P(|Z| > |z|)	0.442	0.442	0.641	0.029	0.017	0.664	0.096	0.062	0.530	0.002	0.138	0,022

Table 5. Proportion of Medicaid Expansion States by 100-Patient Waiver Rate. (2014-2016)

Year	2016				2015				2014			
Quartile (% Medicaid Expansion States)	Q1 (53.8)	Q2 (53.8)	Q3 (58.3)	Q4 (84.6)	Q1 (38.5)	Q2 (46.2)	Q3 (66.7)	Q4 (76.9)	Q1 (46.2)	Q2 (53.8)	Q3 (.50)	Q4 (69.2)
P(|Z| > |z|)	0.442	0.442	0.641	0.029	0.028	0.282	0.234	0.062	0.113	0.470	0.408	0,086

Table 6. Mean Differences in Buprenorphine Waiver Rates by Substance Use Disorder Risk Assessment Group (2016)

	Mean of 30-Patient Waiver rate	Mean of 100-Patient Waiver rate
States with Assessment Policy (n=33)	19.72± 5.74	7.24± 1.71
States without Assessment Policy (n=19)	18.39± 10.64	4.56± 1.97
Pr(T<t)	p=0.4015	p=0.0249

Table 7. 2016 Age Adjusted Opioid Overdose Death Rate by 30 Patient Waived Quartiles

Quartile	Mean	Standard Deviation	Confidence	Interval
Quartile 4	29.18	1.929842	22.94814	35.42109
Quartile 3	21.88	1.37833	17.00273	26.74727
Quartile 2	19.13	2.471079	16.41309	21.84845
Quartile 1	15.11	3.162964	11.30259	18.9128

Table 8. 2016 Age Adjusted Opioid Overdose Death Rate by 100 Patient Waived Quartiles

Quartile	Mean	Standard Deviation	Confidence	Interval
Quartile 4	31.04615	2.478539	26.15917	35.93314
Quartile 3	23.075	2.574794	17.99823	28.15177
Quartile 2	18	1.194539	15.64471	20.35529
Quartile 1	13.26923	1.403265	10.50239	16.03607

Table 9. 2016 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (23.50-89.83)	AK, CT, DC, MA, ME, NH, NM, OH, OR, RI, VT, WA, WV
Quartile 3 (13.56-21.70)	CA, HI, ID, KY, MD, NC, NV, NY, PA, UT, WI, WY, XX
Quartile 2 (9.27-13.37)	AL, AZ, CO, FL, IN, LA, MI, MN, OK, SC, SD, TN, VA
Quartile 1 (2.65-8.91) XX=17.86159659	AR, DE, GA, IA, IL, KS, MO, MS, MT, ND, NE, NJ, TX

XX= National Average

Table 10. 2016 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (9.25-17.6)	AL, CT, KY, MA, MD, ME, NH, NM, PA, RI, TN, VT, WV
Quartile 3 (4.85-9.05)	AR, DC, DE, FL, ID, LA, NC, NY, OH, OK, OR, UT, XX
Quartile 2 (3.30-4.82)	CO, GA, IN, MI, MN, MS, NJ, NV, SC, VA, WA, WI, WY
Quartile 1 (0-3.18)	AK, AZ, CA, HI, IA, IL, KS, MO, MT, ND, NE, SD, TX

XX= National Average

Table 11. 2015 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (17.05-59.25)	AK, DC, DE, KY, MA, MD, ME, NH, NM, RI, TN, VT, WA
Quartile 3 (9.47-16.49)	AL, CT, FL, IN, NJ, NY, OH, OR, PA, SC, UT, WV, XX
Quartile 2 (5.68-9.45)	AZ, CA, CO, GA, ID, IL, LA, MN, MO, NC, ND, NV, VA
Quartile 1 (0.97-5.66) XX=12.29253474	AR, HI, IA, KS, MI, MS, MT, NE, OK, SD, TX, WI, WY

XX= National Average

Table 12. 2015 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (7.81 -20.02)	AK, AL, KY, MA, ME, NH, NM, OH, PA, RI, TN, VT, WV
Quartile 3 (4.39-7.73)	CT, DC, DE, FL, IN, LA, MD, NC, NY, OR, UT, WA, XX
Quartile 2 (2.37-4.37)	CA, CO, GA, ID, MI, MN, MO, ND, NJ, SC, VA, WI, WY
Quartile 1 (0-2.28) XX=	AR, AZ, HI, IA, IL, KS, MS, MT, NE, NV, OK, SD, TX

XX= National Average

Table 13. 2014 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (14.75-28.77)	AK, DC, DE, KY, MA, MD, ME, NH, NM, OH, TN, VT, WA
Quartile 3 (7.05-14.07)	AL, CO, CT, HI, NJ, NY, OR, PA, RI, UT, VA, WV, XX
Quartile 2 (5.31-7.04)	CA, FL, GA, ID, IN, KS, LA, MN, MO, NC, NE, OK, SC
Quartile 1 (0.98-4.87) XX=9.78156987	AR, AZ, IA, IL, MI, MS, MT, ND, NV, SD, TX, WI, WY

XX= National Average

Table 14. 2014 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (6.77-18.82)	AK, DE, KY, MA, ME, NH, NM, OH, PA, RI, TN, VT, WV
Quartile 3 (3.85-6.46)	AL, CT, DC, IN, LA, MD, MI, MS, ND, NY, SC, VA, XX
Quartile 2 (2.22-3.82)	AZ, CA, CO, FL, MN, MT, NC, NJ, OK, OR, UT, WA, WI
Quartile 1 (0.32-2.18) XX=	AR, GA, HI, IA, ID, IL, KS, MO, NE, NV, SD, TX, WY

XX= National Average

Table 15. 2013 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (12.81-27.15)	AK, CT, DC, KY, MA, MD, ME, NM, NY, RI, VT, WA, WV
Quartile 3 (8.29-12.05)	AL, CA, DE, LA, NH, NJ, OH, OR, PA, TN, UT, VA, XX
Quartile 2 (4.53-7.88)	AZ, CO, FL, GA, IL, IN, MI, NC, ND, NV, SC, WI, WY
Quartile 1 (1.61-4.47) XX=	AR, HI, IA, ID, KS, MN, MO, MS, MT, NE, OK, SD, TX

XX= National Average

Table 16. 2013 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (6.49-17.57)	AK, CT, DE, KY, LA, MA, MD, ME, NM, OH, VT, WV, WY
Quartile 3 (3.32-5.87)	AL, FL, MS, NC, NH, NJ, NY, PA, RI, SC, TN, WA, XX
Quartile 2 (1.86-3.23)	AZ, CO, ID, IN, KS, MI, NV, OK, OR, TX, UT, VA, WI
Quartile 1 (0-1.80) XX=	AR, CA, DC, GA, HI, IA, IL, MN, MO, MT, ND, NE, SD

XX= National Average

Table 17. 2012 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (10.91-21.90)	AK, CT, DC, DE, KY, MA, MD, ME, NM, RI, VT, WV, WY
Quartile 3 (6.52-10.80)	FL, LA, NH, NJ, NY, OH, OR, PA, SC, TN, UT, WA, XX
Quartile 2 (5.03-6.18)	AZ, CA, CO, GA, HI, ID, IN, MI, MS, NC, OK, VA, WI
Quartile 1 (1.95-4.98) XX=7.309073807	AL, AR, IA, IL, KS, MN, MO, MT, ND, NE, NV, SD, TX

XX= National Average

Table 18. 2012 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (4.59-9.58)	AK, DC, DE, KY, MA, MD, ME, NM, OH, PA, RI, VT, WV
Quartile 3 (2.80-4.36)	AL, CT, HI, IN, LA, NC, NH, NJ, NY, TN, UT, WI, WY
Quartile 2 (1.53-2.77)	AZ, CO, FL, KS, MI, MS, NV, OR, SC, TX, VA, WA, XX
Quartile 1 (0-1.46) XX=2.773945	AR, CA, GA, IA, ID, IL, MN, MO, MT, ND, NE, OK, SD

XX= National Average

Table 19. 2011 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (9.83-22.14)	AK, CT, DC, HI, KY, MA, ME, NM, NY, OR, PA, VT, WA
Quartile 3 (6.27-9.59)	AL, CA, DE, FL, KS, MD, NH, NJ, OH, RI, UT, WI, XX
Quartile 2 (3.34-5.90)	AZ, CO, GA, IL, IN, LA, MI, MS, NC, TN, VA, WV, WY
Quartile 1 (0-3.21) XX=6.809045	AR, IA, ID, MN, MO, MT, ND, NE, NV, OK, SC, SD, TX

XX= National Average

Table 20. 2011 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (4.55-12.78)	AL, CT, DC, DE, MA, ME, MS, NH, NM, PA, RI, VT, WV
Quartile 3 (2.35-4.53)	AK, FL, KY, LA, MD, NV, NY, OH, OR, TN, UT, WA, XX
Quartile 2 (1.46-2.16)	AZ, CA, CO, IN, MI, MO, MT, NC, ND, NJ, OK, VA, WI
Quartile 1 (0-1.45) XX=2.541359	AR, GA, HI, IA, ID, IL, KS, MN, NE, SC, SD, TX, WY

XX= National Average

Table 21. 2010 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (10.53-26.59)	AK, CT, DE, MA, MD, ME, NH, NM, NY, PA, RI, WA, WV
Quartile 3 (6.48-9.92)	AL, DC, FL, HI, KY, MI, NJ, NV, OR, TN, UT, WY, XX
Quartile 2 (4.47-6.39)	CA, CO, GA, IN, LA, MN, MT, NC, OH, OK, VA, VT, WI
Quartile 1 (1.23-4.44) XX=7.19277	AR, AZ, IA, ID, IL, KS, MO, MS, ND, NE, SC, SD, TX

XX= National Average

Table 22. 2010 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (5.33-12.81)	CT, DE, MA, MD, ME, NJ, NM, NV, NY, PA, RI, TN, WV
Quartile 3 (3.31-5.16)	AL, AR, DC, FL, KY, LA, MI, MS, NH, OH, OR, VT, XX
Quartile 2 (2.02-3.24)	AZ, CA, CO, GA, ID, IN, MO, MT, NC,TX, UT, WA, WI
Quartile 1 (0-1.99) XX=3.539812	AK, HI, IA, IL, KS, MN, ND, NE, OK, SC, SD, VA, WY

XX= National Average

Table 23. 2009 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (9.13-16.20)	AK, DC, FL, HI, MA, MD, ME, NJ, NW, NY, PA, VT, WV
Quartile 3 (7.20-9.05)	AL, CO, CT, KY, MI, NH, NV, OR, RI, SC, TN, UT, WA
Quartile 2 (4.23-7.06)	AZ, CA, DE, GA, KS, LA, MS, NC, OH, OK, TX, WI, XX
Quartile 1 (0.66-4.07) XX=7.060629	AR, IA, ID, IL, IN, MN, MO, MT, ND, NE, SC, VA, WY

XX= National Average

Table 24. 2009 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (3.99-9.20)	FL, KY, LA, MA, MD, ME, MI, MT, NY, RI, UT, VT, WV
Quartile 3 (2.70-3.93)	AL, CT, GA, MS, NH, NJ, OH, OR, PA, TN, WA, XX
Quartile 2 (1.54-2.69)	CA, CO, IL, IN, KS, MN, MO, NC, NM, OK, SC, VA, WI
Quartile 1 (0-1.50) XX=2.917481	AR, AZ, DC, DE, HI, IA, ID, ND, NE, NV, SD, TX, WY

XX= National Average

Table 25. 2008DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (14.58-29.38)	AK, CT, MA, MD, ME, MI, NJ, NM, NV, NY, RI, VT, WV
Quartile 3 (9.84-13.64)	AZ, CA, DC, FL, KY, LA, MS, OR, PA, TN, UT, WA, XX
Quartile 2 (6.08-8.21)	AL, CO, GA, IL, IN, MN, MT, ND, OH, SD, TX, VA, WI
Quartile 1 (1.30-6.00) XX=10.55266	AR, DE, HI, IA, ID, KS, MO, NC, NE, NH, OK, SC, WY

XX= National Average

Table 26. 2008 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (2.86-8.27)	CT, FL, ID, KY, ME, NY, PA, RI, SC, TN, UT, VT, WV
Quartile 3 (1.72-2.81)	CO, DC, GA, IN, MA, MD, MI, NJ, NM, OH, WA, WY, XX
Quartile 2 (1.15-1.70)	AK, AL, AZ, CA, HI, LA, MO, MS, NC, ND, NV, VA, WI
Quartile 1 (0-1.13) XX=1.979651	AR, DE, IA, IL, KS, MN, MT, NE, NH, OK, OR, SD, TX

XX= National Average

Table 27. 2007 DATA Waived Physicians (per 1,000,000 residents), 30 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (11.27-24.37)	AK, CT, DC, FL, MA, MD, ME, NJ, NM, NV, NY, PA, UT
Quartile 3 (8.24-11.23)	AL, AZ, DE, GA, HI, LA, MI, NE, RI, VT, WA, WI, WY
Quartile 2 (6.24-8.08)	CA, CO, KS, KY, MN, NC, OH, OR, TN, TX, VA, WV, XX
Quartile 1 (1.10-6.06) XX=7.618733	AR, IA, ID, IL, IN, MO, MS, MT, ND, NH, OK, SC, SD

XX= National Average

Table 28. 2007 DATA Waived Physicians (per 1,000,000 residents), 100 Patients, States by Quartile

Quartile and Range	State
Quartile 4 (7.77-25.66)	CT, LA, MA, MD, ME, MI, NH, NJ, NY, PA, RI, UT, VT
Quartile 3 (5.65-7.63)	AL, CA, DC, DE, FL, KY, MS, MT, OH, TN, WI, WV
Quartile 2 (3.46-5.55)	AZ, CO, GA, HI, IL, NC, NM, NV, OR, SC, VA, WA, WY
Quartile 1 (0.47-3.23) XX=2.891467	AR, IA, ID, IN, KS, MN, MO, ND, NE, OK, SD, TX, XX

XX= National Average

Table 29. 2016 Opioid Overdose Mortality Rate (per 100,000 residents), States by Quartile

Quartile and Range	State
Quartile 4 (25.2-52)	CT, DC, DE, KY, MA, MD, ME, NH, NM, OH, PA, RI, WV
Quartile 3 (20.3-24.85)	AZ, FL, IN, LA, MI, MO, NJ, NV, OK, TN, UT, VT,
Quartile 2 (14.5-19.7)	AK, AL, AR, CO, ID, IL, NC, NY, VA, WA, WI, WY
Quartile 1 (6.4-13.65)	CA, GA, HI, IA, KS, MN, MS, MT, ND, NE, OR, SC, SD, TX,

Table 30. 2015 Opioid Overdose Mortality Rate (per 100,000 residents), States by Quartile

Quartile and Range	State
Quartile 4 (22-41.5)	CT, DE, KY, MA, ME, NH, NM, OH, PA, RI, TN, UT, WV
Quartile 3 (16.7-21.05)	AZ, DC, IN, LA, MD, MI, MO, NJ, NV, OK, VT, WY
Quartile 2 (13.8-16.2)	AK, AL, AR, CO, FL, ID, IL, MT, NC, NY, SC, WA, WI
Quartile 1 (6.9-13.5)	CA, GA, HI, IA, KS, MN, MS, ND, NE, OR, SD, TX, VA

Table 31. 2014 Opioid Overdose Mortality Rate (per 100,000 residents), States by Quartile

Quartile and Range	State
Quartile 4 (19.4-35,5)	DE, KY, MA, NH, NM, OH, OK, PA, RI, TN, UT, WV, WY
Quartile 3 (16.3-18.7)	AK, AL, AZ, CO, CT, IN, LA, MD, ME, MI, MO, NV
Quartile 2 (12.4-15.1)	AR, DC, FL, ID, IL, MT, NC, NJ, OR, SC, VT, WA, WI
Quartile 1 (7.2-12.15)	CA, GA, HI, IA, KS, MN, MS, ND, NE, NY, SD, TX, VA

Table 32. 2013 Opioid Overdose Mortality Rate (per 100,000 residents), States by Quartile

Quartile and Range	State
Quartile 4 (17.8-32.2)	AZ, DE, KY, LA, NM, NV, OH, OK, PA, RI, TN, UT, WV
Quartile 3 (14.6-17.65)	CO, CT, DC, IN, MA, MD, MI, MO, NH, VT, WI, WY
Quartile 2 (12-14.5)	AK, AL, FL, ID, IL, KS, ME, MT, NC, NJ, SC, WA
Quartile 1 (2.8-11.3)	AR, CA, GA, HI, IA, MN, MS, ND, NE, NY, OR, SD, TX, VA